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US 50/07355

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Title

Hydroplaning Hydrofoil/Airfoil Structures
and Amphibious and Aquatic Craft

5 Field of Invention:

This invention relates to hydroplaning hydrofoils, airfoil structures or flying wing structures, light-weight amphibious structures and aquatic crafts and more particularly to hydroplaning hydrofoil/airfoil

- 10 structures that plane on or through a fluid preferably either water or air which are optionally self-supporting or attached to aquatic structures or watercraft, particularly sailing craft.

15 Background:

Man continues to dream of going faster and faster. On water and through air, this is evidenced by the changing designs of fresh water and ocean racing watercraft and the stealth aircraft flying wings.

- 20 Whatever the design, there is a continuing search for new hydrofoils, and airfoil or flying wing structures which will achieve faster speeds on water and through air. U.S. Patent 4,635,577, granted to Palmquist on January 13, 1987, is an example of one attempt to
25 provide a hydroplaning hydrofoil and air wing supported sailing craft.

Summary of the Invention

According to the present invention there is provided a hydroplaning hydrofoil and airfoil structure
30 for planing on or through a fluid preferably either water or air comprising in its broadest aspects for water as exemplified in Figures 21-23: at least two foils each having an underside plane or substantially planar-bottom surface, two of said planar-bottom
35 surfaces intersecting along a fore and aft longitudinal





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accelerates through to achieve either hydroplane or airfoil support.

However, variations may be readily apparent to those skilled in the art without detracting from the realities of the structures and performances described in this invention. For example the hydroplaning hydrofoil/airfoil structure in its preferred and most preferred configurations offers additional performance options that include planing on or through a fluid such as water or air. Of course in an airfoil configuration such as an ultralight wing aircraft, glider wing or kite, the same shape hydroplaning hydrofoil/airfoil structure performs as an airfoil wing structure or planar wing structure planing or flying through air herein described.

As will be evidenced from the title of this invention, a hydroplaning hydrofoil/airfoil structure for planing on or flying through a fluid is shown supporting itself in Figures 37 to 41. In describing these Figures, the same reference numerals for the same parts will be used as in Figures 4-6 for clarity and simplification.

Figure 37 is an enlarged side view, similar to the hydroplaning hydrofoil/airfoil structure 22 shown in Figures 4, 5, and 6 with fin 52 and struts 53-54 removed, showing an engine or electric motor 36 and air propeller 37 from Figure 1 mounted on stanchion 38 plus a topside air rudder 113 mounted along longitudinal top foil centerline 25 as shown in Figure 40 and elevator or aileron 114 attachment to air rudder 113. This buoyant hydroplaning hydrofoil/airfoil structure 22 is shown hydroplaning at water level 51 prior to flight and in Figure 38 the hydroplaning hydrofoil/airfoil structure 22 or flying wing, planes or flies through air 40 sustained flight.





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Figure 39 is a front view and Figure 40 is a top view of the hydroplaning hydrofoil/airfoil structure 32 shown in Figures 37 and 38 hydroplaning at water level 51 and is similar to the structure shown in Figures 4-6 having the same reference numerals as shown in Figure 6 with fin 52 and struts 53-54 removed.

Figure 41 is a side view of the identical hydroplaning hydrofoil/airfoil structure 32 shown in Figures 4-6 gliding or planing through air. In this figure, fin 52 is retained.

As described for Figures 4-6, the hydroplaning hydrofoil/airfoil structure 32 in Figures 39 and 40 has a left side foil top surface 41 and a right side foil top surface 48 each having a fore foil top section (42 and 49 respectively) converging to form a full length fore and aft longitudinal top foil centerline 23, and a bottom centerline 16 formed by two converging full length foil planar-bottom surfaces, a left side foil planar-bottom surface 21 and a right side foil planar-bottom surface 28. Foil planar-bottom surfaces 21 and 28 ascend transversely from the longitudinal bottom centerline 24 to form a dihedral angle of about 18° as shown or in the range of about 2° to 50° broadly or preferably also in the range of about 2° to 50° or most preferably in the range of about 2° to 30°. Each left side foil planar-bottom surface 21 and right side foil planar-bottom surface 28 has a fore foil planar-bottom section (29 and 30 respectively) which is a forward extension along the longitudinal bottom centerline 24.

Each fore foil planar-bottom section has a swept-back leading edge of 60° as shown or one preferably ranging from about 30° to about 80° swept-back as described for Figures 22 and 26 or most preferably ranging from about 45° to about 70° swept-back as described for Figures 27-29.





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The length of each fore foil planar-bottom section 72 and 80, as shown in Figure 40 is the same as described for Figures 5 and 6, and is about the first one-third of the entire length or chord of the hydroplaning hydrofoil/airfoil structure along longitudinal top foil and bottom centerlines 75 and 76; however, the length of the fore foil planar-bottom sections in their broadest aspects can range from 0° shown in Figure 23 or to the preferred length of about one fourth of the chord length shown in Figure 26 to about the first two-thirds to three-fourths of the chord length along top foil and bottom centerlines 75 and 76 shown in Figures 22 and 25.

Each left side foil planar-bottom surface 77 and right side foil planar-bottom surface 78 has an aft foil planar-bottom section which is a backward or aft extension along the longitudinal bottom centerline 76. As shown in Figures 39 and 40, each aft foil planar-bottom section 68 and 69 at high speed water or fluid level 51 has a forward swept trailing edge 82 of 30° as shown or one preferably ranging from about 0° to about 60° forward swept as described for Figures 22 and 24-26 or most preferably from about 10° to about 45° forward swept as described for Figures 27-29.

The length of each aft foil planar-bottom section 68 and 69 is about the last one-fourth to about one-third of the entire chord length of the hydroplaning hydrofoil/airfoil structure along longitudinal bottom centerline 76 at high speed water or fluid level 51 as shown in Figure 39. The aft foil planar-bottom sections 68 and 69 vary in wetted surface area and length with speed and load; however, it is the section of the hydroplaning hydrofoil/airfoil structure which provides for high speed hydroplaning prior to sustained flight.





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from Figures 4, 5, 6, and 17, enlarged but of identical foil shape, and merely having a weight added to the fore foil sections, performed repetitiously with a surprisingly long glide path, planing or gliding through air, supporting the inherent versatility of the disclosed structures of this invention to plane on or fly through a fluid preferably either water or air. This fore foil stabilized hydroplaning hydrofoil/airfoil structure in the spirit of flight is shown gliding in Figure 41.

In the claims which follow, reference to certain Figures of the drawings is for the purpose of ease of understanding and not by way of limitation.





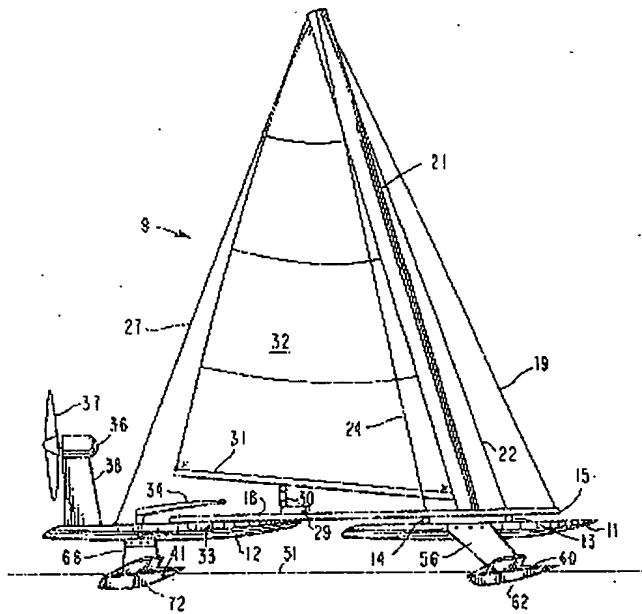
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FIG. 1



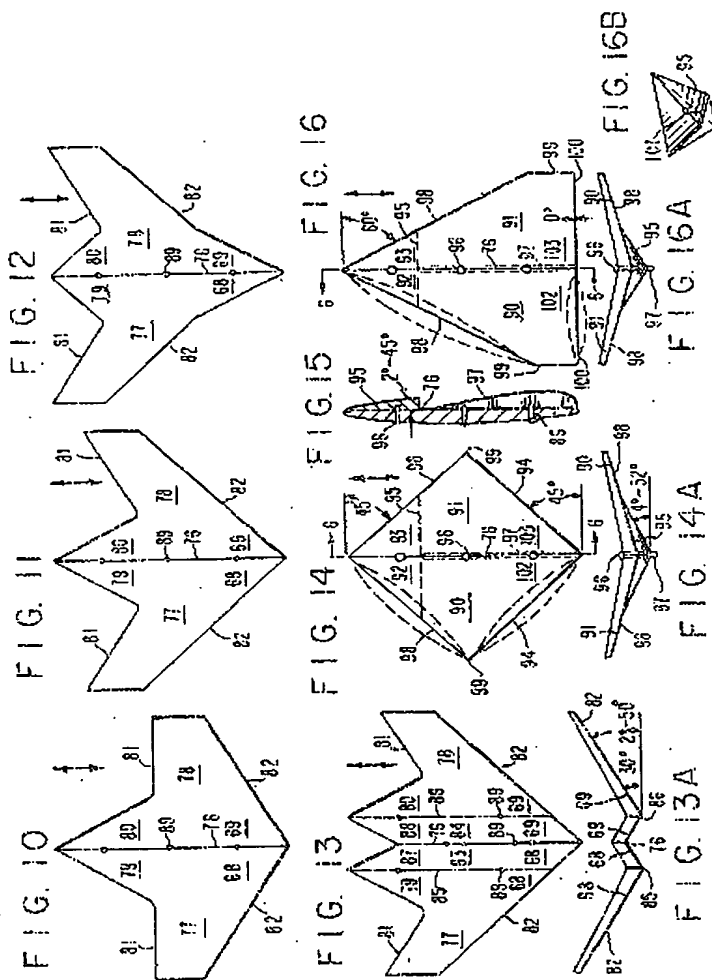


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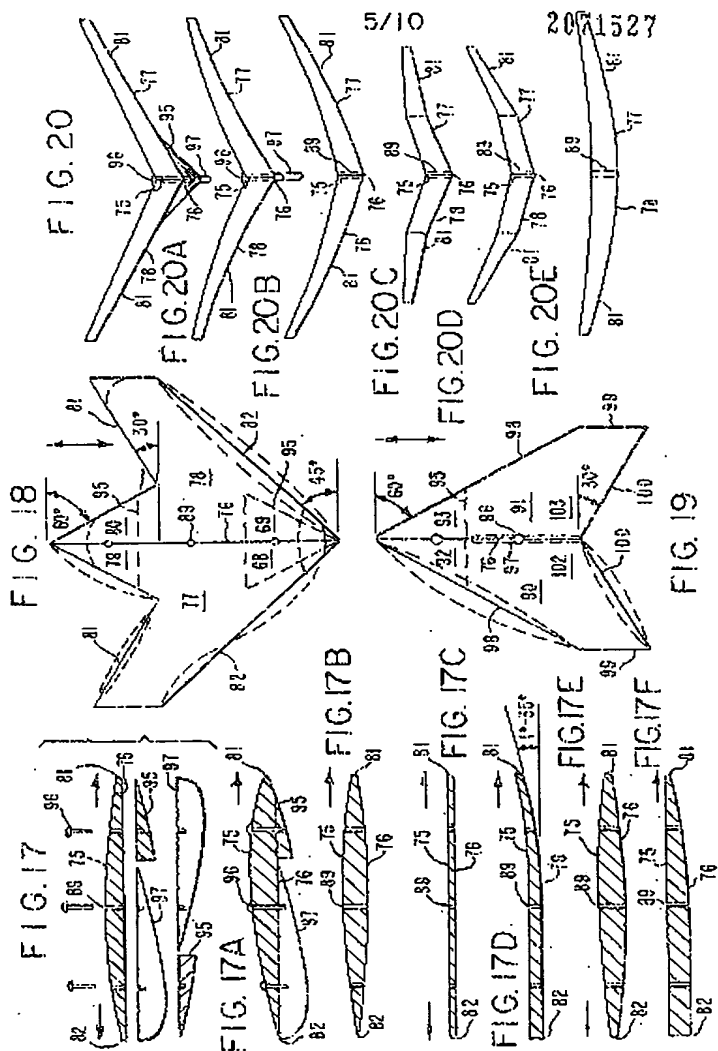
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FIG. 21

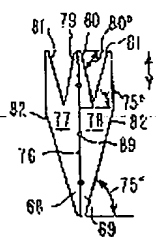


FIG. 22

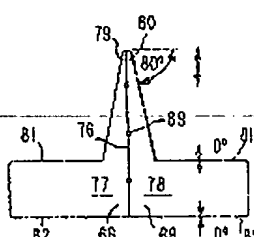


FIG. 23

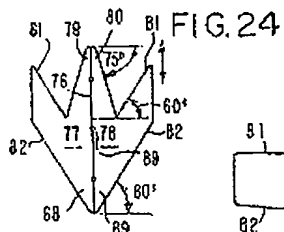
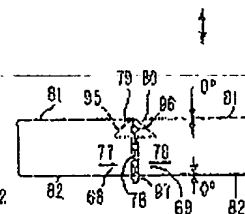


FIG. 24

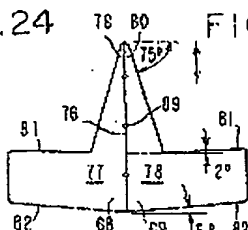


FIG. 25

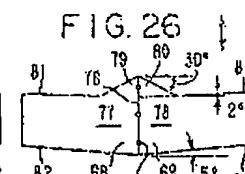


FIG. 26

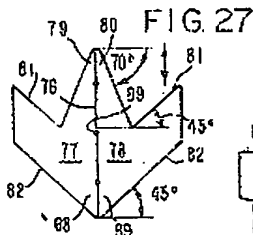


FIG. 27

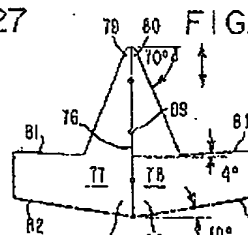


FIG. 28

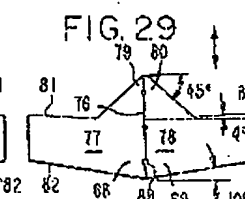


FIG. 29





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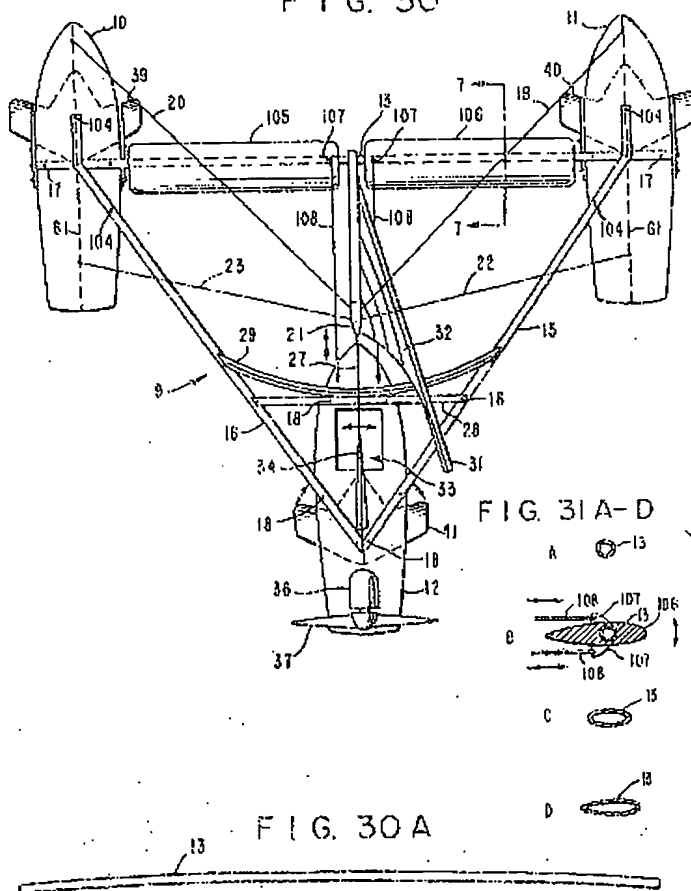


FIG. 31A-D

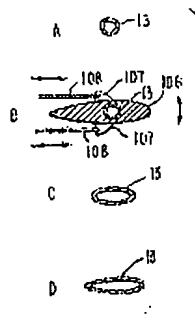


FIG. 30A





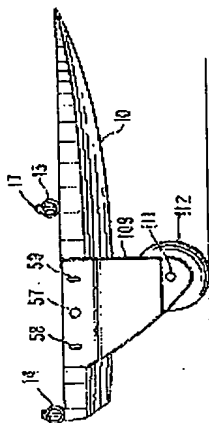
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FIG. 34





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